

WHAT IS CLAIMED

1. A pulse laser system composed of a plurality of replaceable modules, comprising;
 - an ultrafast oscillator module;
 - a nonlinear amplifier module receiving the oscillator output and amplifying the signal while broadening its spectral width;
 - an isolator module for eliminating feedback into the oscillator;
 - a stretcher module for temporally stretching the output of said isolator/polarizer oscillator;
 - a linear pre-amplifier module for amplifying the stretched output;
 - a down-counter module for controlling the repetition rate of the laser system;
 - a power amplifier module for amplifying the output of the down-counter module; and
 - a compressor for temporally shortening the output of said power amplifier module.

2. A pulse laser system composed of a plurality of replaceable modules, comprising;
 - an ultrafast oscillator module;
 - a stretcher module for temporally stretching the output of said oscillator module;
 - a spectral filter module placed before or after said stretcher module;
 - an amplifier module receiving the stretched output and amplifying the signal;
 - an isolator module;
 - a linear pre-amplifier module for amplifying the signal;
 - a down-counter module for controlling the repetition rate of the laser system;
 - a power amplifier module for amplifying the output of the down-counter module; and
 - a compressor for temporally shortening the output of said power amplifier module.

3. A system as claimed in claim 2, wherein said source is an ultrafast oscillator, and further including isolator means for isolating said oscillator from a first of said amplifier stages to a level of at least 35dB.
4. A pulse laser system, comprising the following components:
 - a signal source;
 - a stretcher for temporally stretching an output of said source;
 - a fiber amplifier; and
 - a compressor for recompressing an output of said amplifier; and
 - an AOM for selecting output pulses from said amplifier;wherein each of said components is provided as a pre-tested module, and said system is constructed by connecting said modules via simple fiber splices.
5. A system as claimed in claim 1, wherein ASE is spectrally separated from the signal by one or more said said compressor and at least one of said amplifiers.
6. A system as claimed in claim 1 or 2, wherein an attenuator module which attenuates the oscillator output is located between said oscillator and said non-linear amplifier; and PM-PM splices are used to join said modules.
7. A system as claimed in claim 1 or 2, further including tap modules between selected ones of said modules.

8. A system as claimed in claim 1 or 2, further including polarization modules located between selected ones of said modules.
9. A system as claimed in claim 1 or 2, wherein said down-counter module comprises an AOM, and additionally serves as a bandwidth filter.
10. A system as claimed in claim 1, further including a spectral filter between said oscillator module and said nonlinear amplifier.
11. A system as claimed in claim 1, wherein said preamplifier has a gain bandwidth narrower than the spectrum from the non-linear amplifier, to spectrally filter the output from said non-linear amplifier, said non-linear amplifier shifting ASE to shorter wavelengths away from the signal.
12. A system as claimed in claim 1 or 2, wherein said power amplifier includes a diode-based pump, and serves as a spectral filter.
13. A system as claimed in claim 2, wherein said oscillator produces a relatively broad spectrum output above approximately the 10nm range, and wherein an attenuator module attenuates the oscillator output.
14. A system as claimed in claim 1 or 2, wherein the pulse signal output from said compressor is in the fs regime.

15. An all-fiber chirped pulse amplifier system composed of a plurality of modular optical subassemblies, comprising;

at least an oscillator module, a stretcher module, an amplifier module and a compressor module, each subject to separate assembly and test, and coupled into the system by a fiber splice;

tap units selectively located between ones of said modules for test, monitoring or feedback; and

means between selected ones of said modules for improving fidelity of the polarization state.

16. A pulse laser system, comprising;

a signal source;

a stretcher for temporally stretching an output of said source;

a fiber amplifier; and

a compressor for recompressing an output of said amplifier; and

an AOM for selecting output pulses from said amplifier and serving as a bandwidth filter.

17. A pulse laser system, comprising;

a signal source;

a stretcher for temporally stretching an output of said source;

at least one fiber amplifier stage; and

a compressor for recompressing an output of a final amplifier stage; and

wherein a length of one of said amplifier stages is selected to remove ASE at the lasing wavelength, and said compressor serving as a spectral filter.

18. A system as claimed in claim 17, further including an AOM for selecting output pulses from one of said amplifier stages.

19. A system as claimed in claim 17, wherein said signal source is an ultrafast oscillator, and further including filter means for spectral matching between said oscillator and a first of said amplifier stages.

20. A system as claimed in claim 17, wherein said signal source is an ultrafast oscillator, and further including isolator means for isolating said oscillator from a first of said amplifier stages to a level of at least 35dB.

21. A chirped-pulse amplification system, comprising;
a signal source;
a stretcher module;
at least one amplifier stage, including a non-linear amplifier module and a linear amplifier module;
a compressor module; and
wherein said non-linear amplifier broadens the spectrum of the signal by at least a factor of 2 by self-phase modulation, and said linear amplifier serves as a spectral filter by a mechanism including at least gain narrowing.

22. A system as claimed in claim 21, wherein said compressor module further operates as a spectral filter.
23. A chirped-pulse amplification system, comprising;
an ultrafast oscillator signal source;
at least one amplifier stage;
a compressor module; and
at least one isolator module between said oscillator and a first of said amplifier stages for providing at least 35dB isolation therebetween.
24. A chirped-pulse amplification system, comprising;
an ultrafast oscillator module;
at least one amplifier module;
a down-counter module;
a compressor module; and
means between selected ones of said modules for improving fidelity of the polarization state.
25. A system as claimed in claim 17, where said length is approximately 4m.
26. An active stabilization system for a fiber amplification system, comprising:
a power amplifier including a gain fiber,
a pump source for said power amplifier,

means for directing a portion of the pump light from said pump source into a monitor fiber identical to or equivalent to said gain fiber, so as to clone a temperature dependent spectrum of said gain fiber; and
feedback means for controlling a parameter of said pump source so as to match the pump source wavelength with an absorption spectrum of the gain fiber.

27. A system as claimed in claim 26, wherein said directing means comprises a tap unit.

28. A system as claimed in claim 26, wherein said directing means includes means for collecting scattered or spurious pump light from said pump source.

29. A system as claimed in claim 26, wherein said controlled parameter is a temperature of said pump source.

30. A system as claimed in claim 26, wherein said monitor fiber is said gain fiber.

31. A system as claimed in claim 26, wherein said gain fiber and said monitor fiber are in substantially or fully in thermal contact with one another.

32. A system as claimed in claim 26, wherein said power amplifier is side-pumped.

33. A chirped-pulse amplification system, comprising;
a signal source;
at least one amplifier module;
a compressor module; and
an AOM module located within said amplification system and operating as a pulse deflector, said deflector introducing spatial dispersion; and
said compressor module comprising a bulk grating compressor compensating for said spatial dispersion.

34. A system as claimed in claim 33, wherein said AOM deflector serves as one stage of said compressor.

35. A system as claimed in claim 24, wherein said means between selected ones of said modules comprises a polarizer module which contains at least a polarizer unit tunable to reject light propagating in an unwanted polarization state.

36. A system as claimed in claim 35, wherein one or more of said polarizer modules contain one or more isolator units.